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ABSTRACT

The psychological dimensions hypothesized to describe common instructional treatments and materials, and the relevant psychological characteristics assumed to describe students are discussed in their relationship to studies of aptitude-treatment interaction (ATI). The Annehurst Curriculum Classification System is described as a practical model that is currently available for ATI studies. It may be used to classify learning media as being high or low in experiential, intellectual, motivational, creative, emotional-personal, or social levels of content, design, format, application, or evoked responses. An experiment is described in which 96 ninth-grade students were tested for verbal ability, creativity, and field independence and then asked to express their preferences between pairs of contrasted items representing a variety of learning materials, the Langrehr Annehurst Materials Preference Scale (LAMPS). LAMPS consists of 33 items measuring 11 constructs. A factor analysis of the tests and scales resulted in six factors, and suggested that verbal ability and field independence were statistically significantly related to some of the performances measured by the scale. (Author/CTM)

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Aptitude-Dimension-Interactions - ADI'S

Psychological dimensions within instructional
treatments and their potential interaction with
learners differing in verbal ability, field dependence
• • and creativity.

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INTRODUCTION

After reading the review and synthesis of aptitude treatment interaction (ATI) research written by Cronbach and Snow (1977) one can only be impressed by the persistence of researchers to find significant interactions between various instructional treatments and learners who differ in a particular aptitude. However, the reader is left with a feeling of frustration because so few of the studies identified have resulted in any significant differences in learner outcomes as a result of being exposed to different treatments. The comment of Schulman (1970) is perhaps representative of the frustration felt by serious students of ATI research.

ATI research will likely remain an empty phrase as long as aptitudes are measured by micrometer and environments are measured by divining rod.

Two major initiatives need to be taken if such research is to produce significant findings that can then be applied in the real world of the classroom. The first involves the search for a few global learner aptitudes that really play a powerful and significant role in the way individuals receive, process and store information. Clusters of highly correlated aptitudes, from the hundreds that have been created by laboratory researchers in recent years may help provide some direction.

Many researchers interested in person-environment interactions have already identified what they feel are important, basic, and measurable learner aptitudes. Hunt (1975) for example, has suggested four key accessibility characteristics of learners, namely their cognitive, value, motivational, and sensory orientation. Frymier (1977) and associated

developers of the Annehurst Curriculum Classification System - ACCS have developed these a little further into six psychological and four physiological learner characteristics. The ACCS group see extreme differences in a learner's intelligence, experience, motivation, creativity, emotion - personality, sociability, verbal expression, and aural, visual and motor perception as having a significant effect on the kinds of materials or treatments that learners best interact with.

Most ATI researchers would demand that learner aptitudes be measured with a valid and reliable standardized instrument. The ACCS is unusual in this respect in that it provides tables of descriptors for the researcher or the teacher in the classroom to use in the assessment of individual learners: Tables for the learner characteristics of motivation and intelligence are shown in figure 1.

INTELLIGENCE		MOTIVATION	
rational can integrate ideas contemplative quick to learn intrigued with complexity reflective with ideas has good memory	irrational cannot integrate ideas shallow thinker slow to learn intolerant of complexity impulsive with ideas has poor memory	energetic persistent shows initiative enthusiastic tries hard purposeful inquisitive future-oriented curious able to delay gratification	lazy easily discouraged lacks initiative bored gives up aimless indifferent present-oriented uninterested demands instant gratification

figure 1

Descriptors in the left hand columns describe the characteristics of learners who are high in this aptitude. The ACCS tables allow only a high or low classification of learners.

A continuum obviously exists within every human characteristic -

a continuum which is supposedly accurately measured by standardized tests. However, the placement of learners on an aptitude continuum or a knowledge of national norms for a standardized test, have little practical use for the applications of aptitude treatment interaction findings in the real world. At best we can only realistically think of helping teachers identify students for placement into one of two treatments most suitable for the learner. This is the first step from the usual one choice situation. If we can identify two groups of learners for matching with an open or closed learning environment, divergent or convergent learning materials, and individualized or group instruction for example, we will have made some progress.

Another point against the over reliance on standardized tests for assessing learner aptitudes, is the relatively limited number of observations or responses such tests measure of the learner. Teacher observations of learner behavior and growth inside and outside the classroom, although lacking the objectivity of standardized tests, are frequent and varied in the situations and subject areas they cover. However, teachers still need the support of an instrument of some kind to help them make reasonably accurate identifications, rather than measurements, of extremes in key learner accessibility characteristics. An instrument such as the one provided by the ACCS or alternatively a single pen and pencil test that covers all of the key learner characteristics identified, is urgently required for practical aptitude treatment interaction studies. The visual preference scale identified in this paper may offer another way of assessing extremes in learner characteristics.

What are the important characteristics of a learner that can help the teacher make decisions about providing alternative learning environments, teaching styles, instructional treatments or learning materials? In the past we have relied on the I.Q. as the major measure to assist with 'streaming' of students. Perhaps a measure of a learner's external or internal locus of control is important for making decisions about providing individualized or group instruction or open and closed learning space for a learner. A measure of how open or closed a learner is socially, creatively and intellectually may help with decisions as to whether divergent or convergent exercises, responses and learning materials are appropriate for the learner. For those interested in cognitive styles, a measure of a learner's differentiation or undifferentiation or more specifically their degree of field independence, may be necessary for deciding on structured or unstructured materials and teaching, and on experiences that have a wide and rich range of concepts and ideas.

Whatever the major learner characteristics decided upon, it is important that they be relevant, significant and helpful in making decisions about alternative instruction for different learners.

The second major initiative that needs to be taken in ATI research is the identification of a few significant psychological and physiological dimensions that can exist within all forms of instructional treatments. Previous ATI studies that have attempted to make general statements about the effectiveness of live teacher as against film, television, or programmed learning

treatments for example, must be questioned unless these dimensions have been held constant in each treatment under comparison. It is surely more meaningful to make predictions about the effectiveness of the interaction of a teacher, film, book or any other treatment, with learners varying in an aptitude, if the treatment is described not in general terms, but in terms of those psychological and physiological dimensions that the treatments are rich or deficient in.

Another criticism of ATI research is that studies continue to involve only very small samples of students in a laboratory situation, with treatments lasting for very short periods of time. The treatments chosen are often unrealistic in terms of their likely existence in most classrooms. There is a need for long term field studies that use the common treatments found in most schools, namely teachers, books, dittos and audio-visual materials. This can only be done if we describe and classify these existing treatments in specific psychological and physiological dimensions.

The Annehurst Curriculum Classification System has attempted to identify global and significant psychological and physiological dimensions for learners and learning materials found in schools. In this sense it provides schools with possibly the only current practical aptitude treatment interaction model that can be applied immediately, using available library and classroom resources.

THE PROBLEM

In order to explore potential interactions between learners varying in an aptitude and the psychological dimensions that exist within any treatment, it is necessary to identify these

vital and very significant dimensions. The Annehurst Curriculum Classification System suggests that learning media can be classified as being high or low in the experiential, intellectual, motivational, creative, emotional-personality and social level of their contents, design, format, application or responses evoked in the learner. These global psychological categories are possibly too general to predict what exactly it is within a treatment that is interacting with a particular learner.

A motivating medium, for example, can be thought of as being one that (a) is attractive or stimulating in its design or format (b) involves learner activity followed by immediate feedback or (c) is provocative and engaging in its theme or contents. Similarly learning materials low in intellectual content can be defined as being (a) concrete or practical in the ideas, concepts or applications they deal with (b) low in the higher order thinking they evoke or (c) high in the degree of focus or structure they provide for the learner.

The dimensions suggested in this study are more specific than the six ACCS categories and more general than the ACCS descriptors used in the tables for these categories. The first problem then is to identify appropriate dimensions for the six ACCS psychological categories. These can then be thought as common threads that run, to varying degrees, through any instructional treatment whether it be a live teacher, film, book, ditto or programmed learning module.

This study was primarily concerned with preferences that (a) learners in general and (b) learners varying in specific characteristics have for eleven psychological dimensions that

exist within curriculum materials.

A general question of interest and an assumption of ACCS was 1.0 Do all students, except those low in intelligence and experience, prefer materials that are high in their intellectual, experiential, motivational, creative, emotional-personality and social characteristics? More specifically this study was interested in attaining data to make some comment on the following related questions.

- 1.1 Do learners high in verbal ability (highly correlated with intelligence) prefer the same psychological dimensions within curriculum materials as learners low in verbal ability?
- 1.2 Do learners high in creativity prefer the same psychological dimensions within curriculum materials as learners low in creativity?
- 1.3 Do learners who are field dependent prefer the same psychological dimensions within curriculum materials as learners who are field independent?
- 1.4 Do males and females show any significant differences in the psychological dimensions they prefer in curriculum materials?
- 1.5 Are there any significant correlations between the learner characteristics of verbal ability, field dependence and creativity?

If significant differences are revealed for the preferences that learners high and low in intelligence have for materials that are for example, low in motivation and creativity, then there is a suggestion of a possible disordinal interaction for these learners, and treatments varying markedly in these psycho-

logical characteristics. More precise aptitude treatment interaction studies could be carried out to verify such a suspicion. If the response to learning materials is quite different from individual to individual, then there is a possibility that a learner's cognitive and affective outcomes that develop as a result of using materials with particular psychological characteristics, will depend on the successful matching of learner characteristics and materials characteristics. If such characteristics are in conflict, then we would expect minimal cognitive and affective growth in the learner.

The cognitive style of field dependence-field independence is the one that has been studied most and the one that has greatest application to educational problems. Some students are quite definitely field dependent, global people, who, because they tend to be locked into the field or ground, look for structuring and focusing devices within the materials they learn from. Field independent learners are more articulate in the way they organize and structure their environment. Structuring and focusing devices are not so important for them and in fact may possibly be rejected by them.

Previous studies have suggested the following characteristics of field independent people compared with field dependent people-

- 1) higher structuring and discriminating ability (Strasz 1974)
- 2) lower in their attention and interest in social content of materials and in their sensitivity to social interactions (Fitzgibbons and Goldberger 1966, Nevill 1972, Witkin 1977)
- 3) higher in their interest in theoretical and abstract content (Fitzgerald and Atkinson 1971)

- 4) lower in their need for external motivation through feedback (Renzi 1974)
- 5) higher in their ability to cope with and decode ambiguous stimuli (Nebel Kopf and Dreyer 1970, LeFever and Ehri 1976)

The question is do these characteristics of field independent and field dependent people come through in the kinds of learning materials they prefer and feel most comfortable with?

A study by Koran, Snow and McDonald (1971) is an example of an ATI involving field independence. These researchers hypothesized an interaction between the cognitive style of field dependency, televised versus print representations of teaching skills, and the learning of analytic questions. The televised treatment used the ability of this medium to zoom in and focus on details. Editing, also enabled the sequence of events in the teaching skills to be carefully structured for the viewer. Results of the study indicated that field dependent subjects showed superior outcomes from the televised treatment. The attributes of the medium apparently 'compensated' for perceptual and cognitive processing deficiencies of these subjects. Field independent subjects showed superior outcomes from the print treatment. These people had the ability to focus on and structure the incoming information. The print version gave them the freedom to use this ability whereas the television version limited this freedom. Figure 2 shows this interaction graphically

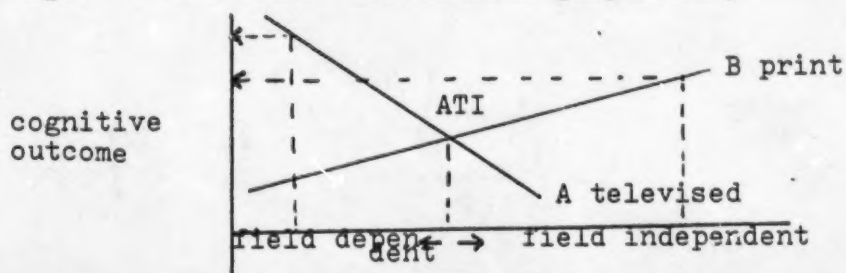


figure 2

Similar interactions could be found for field independent people and treatments high or low in the other psychological dimensions identified above.

Allen (1975) has made a comprehensive survey of studies associated with interactions between learners differing in intellectual ability and media whose messages vary in the focusing, structuring and organizing devices built into their design. Individuals of lower mental ability appear to benefit from media design that provides them with focus, structure and feedback. For example learners low in verbal ability have shown significantly greater growth compared with high verbal learners, from the use of inserted questions in the body of the text (Berliner 1971). Higher order questions were shown to be particularly beneficial for low verbal learners (Shavelson 1974)

Do low verbal learners show a significant difference in their preferences for materials high in focus and structure compared with the preferences of high verbal learners? Previous studies reported by Allen (1975) have mainly considered 'intellectual' differences in learning materials and their effect on learners of varying mental ability. Do similar differences in the motivational, creative, or emotional characteristics of materials for example bring about significant differences in the growth of low and high verbal learners? The preferences of these groups could suggest possible interactions.

Highly creative learners are not necessarily highly intelligent nor are they necessarily field independent. The correlation between these learner characteristics is investigated in this study. Significant differences in the psychological dimensions

of learning materials preferred by learners high and low in creativity will also be sought. Although Torrance (1972) has identified many studies that have shown the ability of learning materials to increase the creative thinking of learners, very few aptitude treatment interactions involving creativity have been reported. This study may suggest possible interactions for future investigation.

The learner characteristics of verbal ability, creativity and field independence were chosen in this study because they represent a major factor of intelligence, a major factor in convergent/divergent thinking and response and a major cognitive style. Extremes in all three characteristics can generally be found in most classrooms. They all appear to have a strong and significant influence in the way learners, high or low in them, interact with instructional treatments.

PROCEDURE

In order to develop an instrument that could assess learner preferences for psychological dimensions within curriculum materials a system that had attempted to identify such dimensions was sought. The most recent and provocative system that has addressed itself to this problem is the Annehurst Curriculum Classification System - ACCS. The developers of the ACCS proposed six psychological characteristics - intellectual, experiential, motivational, creative, emotional-personality and social. The ACCS tables of descriptors that describe and help classify curriculum materials as being high or low in these characteristics are shown in appendix A. Figure 3 shows the curriculum material characteristic of intelligence.

INTELLIGENCE *	
concept-oriented abstract intentions implicit criteria implicit complex organization evokes analysis-type thought evokes synthesis-type thought evokes evaluative-type thought	fact-oriented concrete intentions explicit criteria explicit simple organization evokes recognition evokes isolated-type thought evokes recall

* Figure 3

Before selecting high and low items for a visual preference scale, a decision had to be made as to whether items should represent specific pairs of descriptors, or the category they described in general. A compromise was sought by clustering groups of similar descriptors into subcategories or dimensions. In this way two or three dimensions were identified for each category. Eleven of these dimensions were finally selected for the preference scale. Rather than finding out whether learners of a particular characteristic preferred highly-intellectual materials at the general level or concept oriented material at the specific level, it was felt that their preference for materials

- 1) high/low in focus and structure of contents
 - 2) high/low in the abstract ideas presented and
 - 3) high/low in the higher order thinking evoked
- would be more useful.

Figure 4 shows the sixteen psychological dimensions clustered from the ACCS descriptors for curriculum materials. Materials were selected to represent the eleven dimensions marked with an asterisk.

CATEGORY	EXTERNAL DIMENSION (related to stimulus-format, design, content, uses.....)	INTERNAL DIMENSION (related to response-evoked in learner, e.g. thinking, valuing, judging, using....)
EXPERIENTIAL	degree of <u>specialization</u> * in language, uses, parts.. degree of <u>symbolic</u> representation of reality	degree of <u>difficulty</u> in understanding
INTELLECTUAL	degree of <u>focus/structure</u> * in contents degree of <u>abstraction/</u> * <u>concept development</u>	degree of <u>high-order thinking</u> evoked
MOTIVATIONAL	degree of <u>stimulation or</u> * <u>attractiveness</u> of design degree of <u>provocation</u> in theme or content	degree of <u>learner activity</u> * <u>with feedback</u>
EMOTIONAL-PERSONALITY	degree of <u>ambiguity/</u> * <u>futurism</u> in design, format, theme.....	degree of <u>anxiety/uncertainty</u> produced in learner degree of <u>decision making</u> * demanded of learner
CREATIVE	degree of <u>novelty/</u> * <u>versatility</u> in design, format	degree of <u>unusual/open ended</u> * responses allowed or asked for
SOCIAL	degree of <u>group use</u> demanded by materials	degree of <u>sensitivity/non</u> * <u>prejudice</u> towards social issues

figure 4

2. The development of the Langrehr Annehurst Materials Preference Scale (LAMPS)

The Langrehr Annehurst Materials Preference Scale (LAMPS) consists of thirty-three pairs of photographs or slides. The photographs are black and white and 10" x 8". The slides are 35 m.m. black

and white with both items of a pair reproduced on the one slide. These formats allow individual or group viewing of pairs of items with each item in the pair being visible together for easy comparison. Color was not considered because of the strong preferences that different people have for particular colors and color combinations. The items chosen to be photographed meet the following criteria

1. they are pages from printed curriculum materials used in schools or actual three dimensional, non-book learning devices.
2. they are used in the study of a variety of subjects. These include the language arts, mathematics, science, art and social studies.
3. the degree of difficulty in the use or understanding of their content is not beyond ninth grade students.
4. their intent can easily be assessed by the student with very little reading.

Great care has been taken to ensure that each page in the pair is as identical as possible in the topic discussed, in the typographic layout, and in the intended use of the contents. Many of the pages have been constructed in order to keep the variables in the pair down to a minimum. Many thousands of curriculum materials used in elementary and junior high school were studied over a period of three months. Hundreds of photographs were taken of different items or of the same item with slight modifications made. Each item in a pair has been chosen to represent either a high or low example of one of the eleven psychological dimensions under investigation.

Some other sample items in LAMPS are shown in appendix B. A tape recording accompanies the photographs. A short description lasting about ten to fifteen seconds for each pair, gives a few unbiased comments as to the features of the contents or the intended use of the items. The taped commentary helps to

- 1) overcome differences in the verbal ability of subjects. A minimum of verbal reading of the photographs is necessary as the tape briefly summarizes the message or its intention.
- 2) fix the time of viewing for all subjects. Approximately ten seconds is allowed for viewing the pair of photographs followed by about fifteen seconds of audio commentary. Another ten seconds is allowed for review and response on the response sheet.

Each photograph has a number on the top, outer corner for identification. After viewing, listening and reviewing each pair, the subject was asked to circle the number of the photograph preferred on a response sheet.

3. The Selection of Subjects

Ninety-six ninth grade students at Jonathan Alder High School, Plain City, Ohio were the subjects. This is a rural school on the outskirts of Columbus, Ohio. The scores of these students on Ohio Standardized tests suggest a normal distribution of talent at this grade level. Ninth grade students were selected because of the degree of difficulty of the contents of items in the experiential and intellectual categories. Items in the social category also demanded a maturity expected of students at this grade level.

4. Instruments used

Subjects were given four tests over a period of two fifty minute lessons on two consecutive days. The following tests were used

- 1) The Quick Word Test - level 1: form Am (Borgatta and Corsini 1964). This is a test of verbal ability suitable for ninth graders. It shows a high correlation coefficient r of between 0.6 and 0.8 with major tests of intelligence/mental ability.
- 2) The Wallach and Kogan test of creativity (shortened version)
Four items tested verbal creativity and four items tested figural creativity - two for alternate uses of things, two for similarities between things, two for meanings of patterns and two for meanings of lines.
- 3) The Concealed Figures Test (Thurstone and Jeffrey 1965)
This was used as a measure of field dependence with respect to the ability or inability of a subject to correctly identify a small geometric figure embedded in any of four much larger, more complex figures.
- 4) The Langrehr Annehurst Materials Preference Scale (LAMPS)
This is the visual preference scale developed by the investigator.

5. Scoring subject responses and student classification

The number of words correctly matched with the one hundred words on the Quick Word Test was recorded for each subject. Those students whose scores fell in the top half ($n=48$) were defined as being high in verbal ability/intelligence. Those in the bottom half were defined as being low in verbal ability/intelligence.

The creativity tests were first scored for frequency of responses and then for uniqueness of responses. A unique response was one that no other subject suggested. It was also judged by at least two people as being reasonably appropriate for the questions asked. An occasional bizarre response was rejected. Total unique responses for the eight questions were recorded for each subject. The subjects whose scores fell in the top fifty percent

were defined as being high in creativity and those in the bottom fifty percent were defined as being low in creativity.

The Concealed Figures Test was scored in two ways. The raw score, or the number of correct items minus the number of incorrect items was recorded for each subject. The percentage correct score, or the ratio of correct items over total items attempted expressed as a percent, was also recorded. The correlation between these two methods of scoring was noted. The raw score correct was used to classify learners as being field independent (top fifty percent of raw scores) and field dependent (bottom fifty percent of raw scores).

The preferences for the high or low item in all thirty-three pairs was recorded for each subject.

6. Testing the validity and reliability of LAMPS

How can we be sure that the pairs of items in LAMPS do in fact represent the psychological dimensions identified? In the first instance Drs. J. Frymier and D. Clinefelter and other developers of the Annehurst System studied thirty-six pairs of photographs and assessed which dimension or dimensions the pairs could each represent. This rough subjective sorting procedure was intended to ensure that a balance of items would be present in the scale. Thirty-three pairs were finally selected - three for each of the eleven dimensions suggested.

Measures of the learner variables, together with the preferences learners showed for individual items in the pairs, was fed into the SAS computer package. Correlations between learner characteristics, between items, and between learner types and the eleven dimensions or clusters of item pairs were computed. The computer

factor analysis of the thirty-three item pairs gave both Varimax and Promax rotated factor patterns and associated interfactor correlations and eigen values. Inspection of the size of the eigen values and the plot of eigen values vs. factors, suggested that only six factors or dimensions were coming through in the preference scale. The eigen values of the first nine of the thirty-three factor items were 2.97, 2.34, 1.33, 1.11, 1.02, 0.94/0.80, 0.71, 0.53.

A repeat factor analysis using only six factors was carried out. Inspection of the correlation coefficients for each of the thirty-three items and the six factors was made on both the Varimax and Promax rotated factor patterns. All items that had a correlation coefficient of +0.30 or greater for one or more of the six factors, was counted as being part of that factor.

The item pairs in these new factors were in many cases identical to those proposed by the investigator before the statistical analysis. However new item/pairs were suggested as a result of the analysis. Close inspection of the three to nine item/pairs with correlation coefficients greater than 0.3 for each factor helped to provide labels for them. It was pleasing that the six factors closely resembled those proposed by the Annehurst system. Figure 6 shows the factors, the item numbers used in each factor, their title and their correlation coefficient for the factor they represent. Appendix E shows the Promax factor pattern.

Because the 'high' items in factor 1 were negatively correlated, the factor was called "uncreative design, format/responses allowed." Factor 2 contained items high in abstract/theoretical content (ACCS INTELLECTUAL category).

Factor 3 contained items high in ambiguous design, format or responses required (ACCS EMOTIONAL category).

Factor 4 contained items high in personal decision making and in social interaction (ACCS SOCIAL category)

Factor 5 contained items high in their motivational design, format or theme (ACCS MOTIVATION category)

Factor 6 contained items high in speciality of uses, terms, parts--- (ACCS EXPERIENCE category)

Apart from the expected and moderate interfactor correlations between factor 2 (intellectual) and factor 6 (experiential) $r=0.23$ and factor 1 (creative) and factor 5 (motivational) $r=0.21$, other interfactor correlations were very low or negative.

FACTOR	ITEM, TITLE, CORRELATION COEFFICIENTS FOR FACTOR
1. uncreative design-format/response opportunities (CREATIVE)	11 (town plan) -0.49, 14 (fire) -0.52, 25 (butcher) -0.53, 27 TUF -0.3, 29 (pine cone) -0.40 12 (patterns) -0.32, 13 (cities) -0.45, 20 (motor bike) -0.34, 23 (egg) -0.45, 10 (Italy) +0.50
2. abstract ideas, theme (INTELLECTUAL)	6 (blood clot) 0.55, 7 (plants) 0.47, 8 (pulleys) 0.32, 9 (nuclear fission) 0.59, 21 (floating town) -0.48, 26 (celo) -0.35
3. ambiguous design/responses wanted (EMOTIONAL)	1 (slide rule) 0.56, 5 (add blocks) 0.42, 13 (cities, people) -0.32, 18 (math card) 0.56, 20 (motorbike) 0.51, 17 (crossword) 0.35
4. rich in personal decision making and social inter. (SOCIAL)	22 (on guard) 0.53, 32 (computer man) 0.42, 30 (airplane) 0.33
5. motivating theme format, design-- (MOTIVATIONAL)	15 (microbes) 0.30 4 (objectives) -0.57, 31 (protests) -0.38
6. special terms, uses--- (EXPERIENTIAL)	2 (blood special) 0.61, 3 (skin section) 0.48, 16 (professor) 0.37

figure 6

The validity of the clusters of item pairs in LAMPS to test the preference of subjects for the psychological factors they represent, rests on the result of this factor analysis.

The reliability of item pairs in LAMPS to stimulate the same preference response from a subject was tested one month after the original study. The responses of twenty-five of the original subjects who were free to take a re-test were compared with their original responses. Correlation coefficients for the test-re test responses for individual items in LAMPS averaged between 0.8 and 0.9.

RESULTS

The raw-data displayed in figure 7 shows the preferences of the 96 subjects for the high or low items in (a) each item pair (b) in each of the six factors. Apart from the strong overall preference for highly social material it is obvious that these ninth graders in this study were divided in what they preferred and hence possibly what they would feel most comfortable working with.

Factor	Item	Hi	Lo	Factor	Item	Hi	Lo	Factor	Item	Hi	Lo
1 creative design format or responses R	63/64	50	46	3 unambiguous design, format, uses responses sought	R 1/ 2	50	46	5 motivating theme, format, design	35/36	69	27
	23/24	70	26		R59/60	29	67		11/12	87	9
	13/14	42	54		R 9/10	70	26		15/16	18	78
	69/70	60	36		R 7/ 8	77	19				
	37/38	36	60		R55/56	18	78				
	65/66	50	46		49/50	63	33				
	49/50	63	33	EMOTIONAL		307	269	MOTIVATIONAL		174	114
	9/20	26	70								
	27/28	51	45	4 rich in personal decision making and social interaction	31/32	88	8	6 special uses, terms parts--	21/22	75	21
	17/18	25	71		51/52	79	17		3/ 4	77	19
CREATIVE		473	487		25/26	63	33		33/34	61	35
2 abstract, theoretical ideas, themes applications R	67/68	23	63					EXPERIENTIAL		213	75
	41/42	32	64	SOCIAL		230	58				
	47/48	26	70								
	61/62	30	66								
	43/44	20	76								
INTELLECTUAL		175	391								
	39/40	44	52								

figure 7

96	1.45833333	0.50037642	140.00000000	1.00000000
96	3.93750000	2.49130065	378.00000000	-1.00000000
96	-0.10416667	1.57933475	-10.00000000	-2.00000000
96	1.80208333	1.48409960	173.00000000	-1.00000000
96	2.41666667	0.74926865	232.00000000	0
96	-0.17708333	0.73976940	-17.00000000	-2.00000000
96	2.20833333	0.39344592	212.00000000	0

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / N = 96

		VERBAL	VHILO	CREATIV	CHILO	FDEPRAW	FHILO	FDEPPCT	FPHILO
(CREATIVE)	FACTOR1	[0.29317] 0.0037	0.25219 0.0132	0.17626 0.0858	0.09196 0.3729	0.09778 0.3951	0.13450 0.1914	0.11073 0.2826	0.00633 0.9512
(INTELLECTUAL)	FACTOR2	-0.08998 0.3833	-0.14586 0.1562	-0.07822 0.4487	-0.04117 0.6904	0.00439 0.9661	-0.10608 0.3036	-0.02700 0.7940	-0.04546 0.6600
(EMOTIONAL)	FACTOR3	0.12063 0.2417	0.09172 0.3741	0.10748 0.2972	0.11719 0.2555	0.15149 0.1407	0.03522 0.7329	0.12542 0.1993	[0.23550] [0.0203]
(SOCIAL)	FACTOR4	[-0.23058] 0.0238	-0.13975 0.1744	0.07631 0.4599	0.06756 0.5131	-0.17370 0.0905	-0.16771 0.1024	-0.08641 0.4025	-0.12154 0.2391
(MOTIVATIONAL)	FACTOR5	[0.24842] 0.0147	0.19401 0.0727	0.02726 0.7921	-0.07580 0.4629	0.07445 0.4709	0.01415 0.8911	[0.23062] [0.0239]	0.10772 0.2942

22 (a)

STATISTICAL ANALYSIS SYSTEM 18:45 WEDNESDAY, MARCH

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / N = 96

		VERBAL	VHILO	CREATIV	CHILO	FDEPRAW	FHILO	FDEPPCT	FPHILO
(EXPERIENTIAL)	FACTOR6	0.02514 0.8079	-0.04629 0.6501	0.05999 0.5622	0.00489 0.9423	0.07614 0.4609	0.11720 0.2554	0.00404 0.9589	0.13426 0.0723

FIGURE 8.

From this data one would have to question any suggestion that all learners should be directed towards or forced to use, materials that are high in motivational, intellectual, emotional or creative content, design or format. As might be expected some learners prefer, and hence would possibly show greater cognitive and affective learning outcomes from materials that are abstract, limited in focus and demanding in the higher order thinking and decision making they evoke. For other learners the opposite is true. Some students prefer convergent materials and responses, some divergent materials and responses. There are some who prefer highly motivating materials and there are some who prefer materials low in motivation.

The next question is "What characteristic of an individual learner causes him or her to accept or reject, consistently and strongly, particular psychological dimensions within learning materials?" Only three learner characteristics were investigated - verbal ability, creativity and field independence. Inspection of the data in figure 8 suggests the following significant results -

- 1) highly verbal subjects showed the strongest preference for materials low in creative design and in creative opportunities for the learner. $r = +0.29, p < .004$
- 2) field independent and highly verbal subjects showed the strongest preference for materials that are motivating in their design or theme $r = +0.24, p < .03$, $r = +0.25, p < .01$
- 3) subjects classified as being field independent on the basis of percentage scores on the concealed figures test showed the strongest preference for materials ambiguous in design/responses $r = +0.24, p < .02$ sought

4) highly verbal subjects showed a significant negative correlation in their preferences for material defined as being high in decision making/social interaction $r = -0.23$ $p < .02$

It is also of interest that field independent subjects (raw score) were the only group to show a positive correlation with materials that are abstract in their content.

Correlations between sex and the six factors did not reveal any significant differences in the preferences of males or females (appendix C)

Significant positive correlations were found between the following learner characteristics. (appendix D)

verbal ability - creativity $r = +0.29$, $p < .004$

verbal ability - field independence $r = +0.47$, $p < .001$ (raw score)
 $r = 0.54$, $p < .0001$ (% score)

field independence - field independence $r = +0.79$, $p < .0001$
(raw score) (percent score)

field independence - creativity $r = +0.32$, $p < .002$
(raw score)

DISCUSSION

The high correlation between field independence and verbal ability found in this study ($r = +0.47$, $p < .0001$) is not surprising. Goldstein and Blackman (1978) after reviewing twenty studies involving these variables suggest that correlations between field independence and verbal intelligence are mostly in the 0.40 - 0.60 range.

It was pleasing to note the high correlation between the

two methods commonly used to score field independence ($r=+0.79, p<.0001$) Many summaries of studies concerned with this variable do not report the method of scoring. In this study students were rated as being highly field independent if their scores fell in the top half of the 96 subjects. Because field independency was scored by both the raw score method and the percentage method, each subject was rated as being high or low in field independence in two ways. There were infact 24 out of a possible 96 reversals of ratings when one compared the rating of subjects via the raw score method as against the percentage score method. All calculations in this study were based on the more usual raw score method.

Although Goldstein and Blackman's review of studies concerned with creativity and field independence suggest little relationship between the two variables, this study shows a significant relationship of $r = +0.32, p < .002$.

Correlations between learner variables, particularly field independence, and materials variables were not as significant as expected. From previous studies field independent people have shown to be better than field dependent people at handling abstract, ambiguous material. Field dependent subjects do better with material that is rich in social content and that offers feedback. This study showed that field independent subjects (using a high/low split of percentage score correct on

the concealed figures test) were significantly correlated with material that was ambiguous in design, format, uses or responses sought. ($r = 0.24$, $p < .02$) Only a slight positive correlation was found between field independence (raw score) and materials defined as being abstract and theoretical in content (factor 2) $r = 0.005$, $p < .967$

The results of this particular study indicate that differences in learner characteristics do have a significant interaction with particular psychological dimensions or factors in curriculum materials. As more data is collected from a greater number of students, from different schools, and different grade levels, a clearer picture will hopefully develop. Repeated statistical analyses of this data should help verify the number of factors, and the items most representative of these factors, that appear to exist in LAMPS, the Langrehr Annehurst Materials Preference Scale. If stable and significant correlations form between learner characteristics and the preferences for these factors in LAMPS, then this instrument could be a useful aid to help teachers identify and support their own judgements about the key accessibility characteristics of their learners. Such correlations would also provide future researchers with possible variables to use in aptitude-dimension interaction studies. Finally this pilot study has supported the ACCS notion that at least six major psychological factors do exist in curriculum materials and that these in turn interact with differences in learner characteristics.

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CURRICULUM

EXPERIENCE *	
special terminology provides vicarious experience requires special training to use advanced/difficult reading level advanced in nature representative of reality examples and illustrations are complex and difficult to understand	common vocabulary provides direct experience no special training required simple/beginning reading level introductory in nature original or actual thing examples and illustrations are simple and understandable

INTELLIGENCE *	
concept-oriented abstract intentions implicit criteria implicit complex organization evokes analysis-type thought evokes synthesis-type thought evokes evaluative-type thought	fact-oriented concrete intentions explicit criteria explicit simple organization evokes recognition evokes isolated-type thought evokes recall

* MOTIVATION	
attractive stimulating evocative examples provocative marked contrast compelling unique complex immediate feedback activity-oriented	plain calming routine examples lacking or not provocative contrast not evident bland ordinary simple or uniform feedback not available passivity-oriented

CHARACTERISTICS

* EMOTION-PERSONALITY	
ambiguous change-oriented ego involving or reflects positive sense of self esteem reflects appropriate expression of emotion decisions controlled by the learner requires student to make decisions and abide by the consequences	set and unequivocal stasis-oriented non-ego involving or reflects negative sense of self esteem reflects inappropriate expression of emotion decisions controlled by others or by chance does not require student to make decisions and abide by the consequences

* CREATIVITY	
evokes imagination open-ended versatile alternative responses possible nondirective interrogative unusual novel does not lend itself to being judged right or wrong	evokes limitation closed limited restricted responses required directive declarative predictable conventional does lend itself to being judged right or wrong

* SOCIAL	
respects individuality reflects positive concern for people who are different reflects sensitivity to people reflects positive concern for people and things nonprejudicial fosters interpersonal skills	stereotypical reflects negative concern for people who are different lacks sensitivity to people reflects negative concern for people and things prejudicial no interpersonal skills required

CURRICULUM

VERBAL EXPRESSION (SPEECH)	
(Appropriate)	(Does not Apply)
requires expanded verbal response requires sequencing of spoken terms requires categorizing requires differentiation of opposites requires discrimination of parts and wholes requires discrimination of singular and plural forms emphasizes rhythm of language	requires simple yes-no verbal response does not require sequencing of spoken terms does not require categorizing does not require differentiation of opposites does not require discrimination of part and wholes does not require discrimination of singular and plural forms does not emphasize rhythm of language

AUDITORY PERCEPTION	
(Appropriate)	(Does not Apply)
requires organizing, reproducing, or sequencing of sounds and words requires identifying auditory similarities requires identifying auditory differences auditory directions required requires identifying specific sounds requires learning rhymes, songs, and finger plays	does not require organizing, reproducing, or sequencing of sounds and words does not require identifying auditory similarities does not require identifying auditory differences auditory directions not required does not require identifying specific sounds does not require learning rhymes, songs, and finger plays

CHARACTERISTICS

VISUAL PERCEPTION	
(Appropriate)	(Does not Apply)
requires the student to identify visual similarities and differences requires the student to organize, reproduce, and remember a sequence of visual stimuli requires finding a specific object against a crowded visual environment or background requires the student to differentiate right-left, front-back, near-far, top-bottom, and comparable characteristics of visual stimuli	does not require the student to identify visual similarities and differences does not require the student to organize, reproduce, and remember a sequence of visual stimuli does not require finding a specific object against a visual environment or background does not require the student to differentiate right-left, front-back, near-far, top-bottom, and comparable characteristics of visual stimuli

MOTOR PERCEPTION	
(Appropriate)	(Does not Apply)
requires body balance requires locomotor activity involves body parts requires imitative movements requires fine motor coordination requires using body parts of one or both sides of the body requires hand and arm movements past the midline of the body while head and body are stationary	does not require body balance does not require locomotor activity does not involve body parts does not require imitative movements does not require fine motor coordination does not require using body parts of one or both sides of the body does not require hand and arm movements past the midline of the body while head and body are stationary

APPENDIX B

11 Chapter 11 COMMUNICATING

OBJECTIVES

- After reading this chapter you should be able to:
1. define the term communication.
 2. give an example of at least a communication model.
 3. list at least a reason or reasons and a way they are communicated with others.
 4. explain the meaning of the term "body language".



Body Language
When the most important of all means of communication is the body, it is called body language. It is the way we use our bodies to communicate. It is the way we use our faces, hands, feet, and other parts of our bodies to communicate. It is the way we use our bodies to communicate with others.

When the Teacher Communicates
When a teacher is in a class, he or she is always communicating. He or she is always using his or her body to communicate. He or she is always using his or her face, hands, feet, and other parts of his or her body to communicate. He or she is always using his or her body to communicate with his or her students.

12 Chapter 12 COMMUNICATING



Body Language
When the most important of all means of communication is the body, it is called body language. It is the way we use our bodies to communicate. It is the way we use our faces, hands, feet, and other parts of our bodies to communicate. It is the way we use our bodies to communicate with others.

When the Teacher Communicates
When a teacher is in a class, he or she is always communicating. He or she is always using his or her body to communicate. He or she is always using his or her face, hands, feet, and other parts of his or her body to communicate. He or she is always using his or her body to communicate with his or her students.

MOTIVATION

(motivating format, focus)

11- high 12- low

n=96

87

9

"11 and 12 are identical except that 11 tells you exactly what to concentrate on when you study it----"

25



IN GUARD

ANOTHER
THINKING
GAME
FOR
EVERYONE

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25



LION HUNT

26 (rich in personal decision making)

25-high 26-low

n=96

63

33

"25 is a game for those who like to make their own decisions and plans---26 is a dice game where chance often decides who wins."

69

69

69 Order of Operations

How would you do the computation to make the following expression true?

Can you think of more computational rules needed to get the answer? Recall the rules for the order of operations with whole numbers. Do you agree to use the same rules when dealing with integers?

Example 1

Calculate

$10 + 5 \times 2 = 20$

Example 2

Calculate

$10 + 5 \times 2 = 20$

Example 3

Calculate

$10 + 5 \times 2 = 20$

Example 4

Calculate

$10 + 5 \times 2 = 20$

Example 5

Calculate

$10 + 5 \times 2 = 20$

Example 6

Calculate

$10 + 5 \times 2 = 20$

Example 7

Calculate

$10 + 5 \times 2 = 20$

Example 8

Calculate

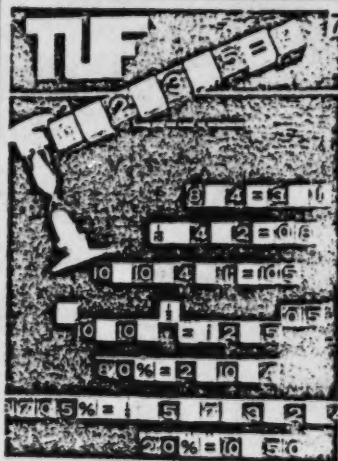
$10 + 5 \times 2 = 20$

Example 9

Calculate

$10 + 5 \times 2 = 20$

70



CREATIVITY

(creative responses sought)

69-low

70-high

n=96

60

36

"--69 gives you some math problems while 70 allows you to make up some similar math problems for checking by the teacher."

STATISTICAL ANALYSIS SYSTEM

19:45 WEDNESDAY, MARCH 24

N	MEAN	STD DEV	SUM	MINIMUM
72	1.50000000	0.50350981	108.00000000	1.00000000
96	3.93750000	2.49130065	378.00000000	-1.00000000
96	-0.10416667	1.57933475	-10.00000000	-2.00000000
96	1.80208333	1.48408960	172.00000000	-1.00000000
96	2.41666667	0.74926865	232.00000000	0
96	-0.17708333	0.73976940	-17.00000000	-2.00000000
96	2.20833333	0.89344592	212.00000000	0

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

SEX

FACTOR1 -0.15158
0.2037
72

FACTOR2 -0.07231
0.5451
72

FACTOR3 -0.16305
0.1712
72

FACTOR4 -0.11028
0.3564
72

FACTOR5 -0.12632
0.2904
72

FACTOR6 -0.03051
0.7995
72

APPENDIX C

FIGURE 9.

STATISTICAL ANALYSIS SYSTEM

19:33 TUESDAY, MARCH

N	MEAN	STD DEV	SUM	MINIMUM
96	51.75000000	12.18540974	4968.00000000	28.00000000
96	1.50000000	0.50262469	144.00000000	1.00000000
96	5.85416667	5.49253880	562.00000000	0
96	1.48958333	0.50251560	143.00000000	1.00000000
96	44.85416667	19.01964589	4306.00000000	11.00000000
96	1.50000000	0.50262469	144.00000000	1.00000000
96	75.61458333	10.82528210	7259.00000000	45.00000000
96	1.45833333	0.50087642	140.00000000	1.00000000

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / N = 96

	VERBAL	VHILO	CREATIV	CHIL0	FDEPRW	FHILO	FDEPPCT	FPHILO
VERBAL	1.00000 0.0000	0.80949 0.0001	* [0.28978] 0.0042	0.17147 0.0948	* [0.46547] 0.0001	0.28530 0.0048	* [0.53862] 0.0001	0.45531 0.0001
VHILO	0.80949 0.0001	1.00000 0.0000	0.12583 0.2219	0.06251 0.5451	0.40080 0.0001	0.33333 0.0009	0.48269 0.0001	0.45993 0.0001
CREATIV	0.28978 0.0042	0.12583 0.2219	1.00000 0.0000	0.74313 0.0001	0.31760 0.0016	0.20971 0.0403	0.29629 0.0034	0.26561 0.0089
CHIL0	0.17147 0.0948	0.06251 0.5451	0.74313 0.0001	1.00000 0.0000	0.24654 0.0155	0.18754 0.0673	0.17631 0.0857	0.18645 0.0689
FDEPRW	0.46547 0.0001	0.40080 0.0001	* [0.31760] 0.0016	0.24654 0.0155	1.00000 0.0000	* [0.78729] 0.0001	0.77836 0.0001	0.62807 0.0001
FHILO	0.28530 0.0048	0.33333 0.0009	0.20971 0.0403	0.18754 0.0673	0.78729 0.0001	1.00000 0.0000	0.55427 0.0001	0.50175 0.0001
FDEPPCT	0.53862 0.0001	0.48269 0.0001	0.29629 0.0034	0.17631 0.0857	0.77836 0.0001	0.55427 0.0001	1.00000 0.0000	0.79588 0.0001
FPHILO	0.45531 0.0001	0.45993 0.0001	0.26561 0.0089	0.18645 0.0689	0.62807 0.0001	0.50175 0.0001	0.79588 0.0001	1.00000 0.0000

APPENDIX D

FIGURE 10

STATISTICAL ANALYSIS SYSTEM

19:33 TUESDAY, MARCH

METHOD: PROMAX

PROMAX ROTATED FACTOR PATTERN

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
ITEM1	0.07443	0.19664	0.55995✓	0.03761	0.05044	0.05148
ITEM2	0.05011	-0.03425	0.05152	0.02615	-0.01416	0.61151✓
ITEM3	-0.08812	0.24657	0.01283	0.15769	-0.18128	0.49786✓
ITEM4	0.00893	-0.06605	0.01783	-0.10803	-0.56991✓	0.02416
ITEM5	-0.18449	-0.12830	0.41881✓	0.20036	0.11662	0.26852
ITEM6	-0.12587	0.54883✓	-0.02968	0.06722	-0.04140	-0.16928
ITEM7	0.00345	0.47144✓	-0.00571	-0.24589	0.07206	0.22346
ITEM8	0.14244	0.31860✓	0.27091	-0.18494	0.19394	0.03385
ITEM9	0.02466	0.59062✓	0.02159	0.10999	-0.12122	-0.03397
ITEM10	0.50106✓	-0.10694	-0.02840	-0.00634	-0.19314	0.02829
ITEM11	-0.48898✓	-0.04690	-0.10152	0.08042	-0.14804	-0.08681
ITEM12	-0.32325✓	0.04101	0.17991	0.26597	0.20274	0.03765
ITEM13	-0.44838✓	-0.13978	-0.31768✓	-0.06379	0.26963	0.05693
ITEM14	-0.52216✓	0.12811	-0.01729	-0.08666	-0.18816	-0.29343
ITEM15	-0.15180	-0.14964	0.06630	0.18093	0.29384✓	-0.26500
ITEM16	0.10600	-0.22440	-0.06157	-0.12077	0.05658	0.36981✓
ITEM17	0.01018	-0.24872	0.35045✓	0.14406	-0.08151	-0.15934
ITEM18	0.07751	-0.04972	0.55889✓	0.05863	-0.23846	-0.18316
ITEM19	-0.60352✓	0.06567	0.14424	-0.22618	-0.11108	0.06306
ITEM20	-0.33768✓	0.01067	0.50528✓	-0.21899	-0.01689	0.07669
ITEM21	0.04040	-0.47651✓	0.03555	-0.08669	-0.00871	0.08161
ITEM22	0.06955	0.04197	0.26199	0.52274✓	-0.06901	-0.02344
ITEM23	-0.44719✓	0.12781	-0.19741	0.20237	-0.04998	0.20466
ITEM24	0.04100	-0.20853	0.09743	-0.02274	0.26628	0.14435
ITEM25	-0.53253✓	-0.13425	0.18375	-0.02306	0.24804	-0.09069
ITEM26	-0.23446✓	-0.35478✓	0.02032	-0.24976	0.01548	-0.08992
ITEM27	-0.30051✓	-0.20419	-0.00730	0.09615	-0.10552	0.17139
ITEM28	0.13210	-0.01259	0.03775	0.04424	-0.13040	0.06574
ITEM29	-0.39848✓	0.05716	-0.06520	0.12928	0.22595	-0.15215
ITEM30	-0.19913	-0.07122	-0.00855	0.33250✓	-0.14175	0.12748
ITEM31	-0.03591	0.04857	0.12027	0.18770	-0.38202✓	-0.00065
ITEM32	0.00024	0.20969	-0.05281	0.42391✓	0.21301	-0.08771
ITEM33	0.08025	-0.12277	0.25057	0.14417	0.03128	0.07910

UNCREATIVE
DESIGN/
RESPONSE
POSSIBLE

ABSTRACT AMBIGUOUS
PROMAX TRANSFORMATION MATRIX

DECISION
MAKING
MATRIX

MOTIVATING
THEME/
FORNITE

SPECIAL
TERMS/
USES.

	1	2	3	4	5	6
1	1.02700	-0.07923	0.06683	-0.00291	0.06159	0.02905
2	-0.10904	1.07081	-0.07486	0.04396	0.06457	-0.14457
3	0.10116	-0.10491	1.06974	0.12734	-0.06475	-0.08089
4	-0.00134	0.02853	0.10265	1.02009	0.02798	0.02655
5	0.05952	0.05773	-0.08817	-0.01635	1.02009	-0.02337
6	0.07721	-0.22260	-0.12252	-0.07225	0.01639	1.07572